CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: June 3, 2021

TO: Nate Willis – WY/3

FROM: Wade Strickland – WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the General Mitchell International Airport WPDES Permit No. WI-0046477-05-0

This is in response to your request for an evaluation of the need for water quality-based effluent limitations using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the General Mitchell International Airport (GMIA) in Milwaukee County. The facility discharges to a tributary to Wilson Park Creek located in the Milwaukee River Basin and Oak Creek located in the Root River Basin. Discharges from Outfalls 001 and 007 are included in the Milwaukee River TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis:

Inflow 701
The permit should continue to require monitoring for BOD_5, TSS, pH, and phosphorus. Monitoring is recommended for chlorine, copper, zinc, and chloride due to the levels of these pollutants detected at Outfall 007. Monitoring is also recommended for dissolved oxygen to investigate downstream impacts on dissolved oxygen levels.

Outfall 001 to Wilson Park Creek

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Annual Sum	Footnotes
BOD_5						1
TSS					2814.54 lbs/year	2
pH	9.0 s.u.	6.0 s.u.				
Dissolved Oxygen						1
Phosphorus					28.35 lbs/year 1.0 mg/L	2
Chlorine						3
Copper						3
Zinc						3
Chloride						3
Hardness						3

Outfall 003 to a Tributary to Oak Creek

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5						1
TSS						3
pH	9.0 s.u.	6.0 s.u.				
Dissolved Oxygen						1

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Phosphorus						2
Interim Limit				1.0 mg/L		
Final Limits				0.225 mg/L	0.075 mg/L 2.3 lbs/day	
Chlorine						3
Copper						3
Zinc						3
Chloride						3
Hardness						3

Outfall 007 to Wilson Park Creek

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Annual Sum	Footnotes
BOD_5						1
TSS					63,441 lbs/year	2
pH	9.0 s.u.	6.0 s.u.				
Dissolved Oxygen						1
Phosphorus					730.21 lbs/year 1.0 mg/L	2
Chlorine						3
Copper						3
Zinc						3
Chloride						3
Hardness						3

Footnotes:

1. Effluent and downstream DO monitoring is to determine whether the DO water quality standard of 5.0 mg/L is met during deicing periods and provide information to determine BOD discharge levels which ensure DO standards are met.
2. The mass limits for phosphorus and TSS and a compliance schedule for Outfalls 001 and 007 are required in accordance with the wasteload allocations specified in the Milwaukee River TMDL. A narrative interim limit with language similar to the following should also be included in the permit: "The facility shall be operated such that the amount of phosphorus being discharged on an annual basis does not increase over the permit term, and that phosphorus reductions will occur over time through best management practices."

3. Monitoring only. Hardness monitoring is recommended due to the relationship between water hardness and metals toxicity.

Along with the chemical-specific recommendations mentioned above, the need for acute and chronic whole effluent toxicity (WET) monitoring and limits has also been evaluated for the discharge from GMIA. Acute WET testing of the discharges is recommended, and the permit will include a one-year schedule to develop a testing plan. WET testing data should meet the following criteria:

- Tested samples should be composed of only deicing-affected runoff from the GMIA site in order to measure toxicity associated with deicing activities (not a combination of receiving water and deicing water, like samples from Outfall 007).

- Tests must be performed on *Ceriodaphnia dubia* and fathead minnow using approved test methods in s. NR 219.04, Wis. Adm. Code.
- Tests should be scheduled to representatively capture toxicity from both storm events and snow melting events.
- The total set of tests each year should cover each type of deicer and anti-icer product used and different types of weather events that may occur (e.g., freezing rain, falling snow, and melting snow).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Rachel Fritz at Rachel.Fritz@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (2) – Narrative & Map

PREPARED BY:

Rachel Fritz Date: 6/3/21

Rachel Fritz, Water Resources Engineer

E-cc: Jacob Wedesky, Wastewater Engineer – SER/Milwaukee
Bryan Hartsook, Regional Wastewater Supervisor – SER/Milwaukee
Diane Figiel, Water Resources Engineer – WY/3
Jake Zimmerman, Water Resources Engineer – SER/Waukesha
Kari Fleming, Environmental Toxicologist – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
General Mitchell International Airport

WPDES Permit No. WI-0046477-05-0

Prepared by: Rachel Fritz

PART 1 – BACKGROUND INFORMATION

Facility Description:

General Mitchell International Airport (GMIA) is approximately 2,200 acres in size and is served by a Milwaukee County-owned municipal separate storm sewer system consisting of about 25 miles of storm sewers and 5 miles of ditch. Runoff from rain and snow melt at the airport during winter may contain glycol and other chemicals used to deice or anti-ice aircraft and runways. Effluent from oil water separators on site is also discharged to the storm sewer system. Deicing and anti-icing activities are mandatory requirements of the Federal Aviation Administration to ensure adequate safety for airport operations. The most concerning contaminated runoff problems are seasonal during the periods of deicing or anti-icing in the winter. At other times, the runoff from the airport is typical of urban storm water runoff.

The deicer and anti-icers are composed of mostly propylene glycol with other chemical additives. The glycol is an environmental concern because of its high biochemical oxygen demand (500,000 to 1,000,000 mg/L BOD_5), which depletes the dissolved oxygen in the receiving water, and additives in the glycol can be toxic to aquatic life. Deicer and anti-icer usage during a deicing season ranges between 100,000 to 250,000 gallons per year (undiluted) depending on weather conditions. Propylene glycol-based deicing and anti-icing fluids make up the vast majority of those used at the airport now, as the use of ethylene glycol has been almost completely eliminated. This is because ethylene glycol was listed as a hazardous material, and there's a preference for propylene glycol for safety and greater value if recycled.

There are two categories of glycol products used for aircraft deicing, depending on whether they remove ice and snow or if they prevent it from accumulating. Type I deicing fluids are used to remove ice and snow on the aircraft. Type IV anti-icing fluids are used to prevent any accumulation of ice or snow on clean aircraft surfaces. Anti-icing fluids are thicker than Type I to adhere to the aircraft and provide increased hold over time prior to takeoff. For pavement deicing, the airport uses a liquid deicer potassium acetate or a solid mixture of sand and sodium acetate. Advances in the technology of deicing and anti-icing aircraft include the selection of freeze point depressants (glycol or some other chemical), improved application methods with hybrid deicing vehicles, use of new glycol formulations with less toxic additives, and conservation incentives, which have helped to reduce the potential for environmental impacts associated with airport runoff.

Airport runoff enters the storm sewer system and combines with any upstream receiving water flow directed through the storm sewer system. The storm sewer discharges from three major outfalls with two that enter the Kinnickinnic River via Wilson Park Creek and one into a tributary to Oak Creek.

Attachment #1

Sample Point Designation	
Sample Point	**Sample Point Location, Waste Type/sample Contents and Treatment Description (as applicable)**
001	Discharge of storm water runoff from the Cargo Ramp area to Wilson Park Creek tributary to the Kinnickinnic River. The outfall is located on the west end of the airport.
003	Discharge of storm water runoff from the southern most runways and taxiways to a tributary of Oak Creek. The outfall is located at the southeast corner of the airport at College Avenue.
007	Discharge of storm water and groundwater infiltration from the terminal ramp area plus the runways and taxiways on the north-central parts of the airport to Wilson Park Creek tributary to the Kinnickinnic River. The outfall is located at the northwest corner of the airport at Howell and Layton Avenues.

The airport is implementing a Storm Water Pollution Prevention Plan to minimize the discharge of contaminated runoff into the airport's storm sewer system. A monitoring program of weekly visual inspections and chemical analysis during weeks of storm events is used to characterize the storm water runoff to evaluate best management practices, and to provide a continuing database for water quality changes. Monitoring locations consist of the inflow to the airport's storm sewer system, three storm sewer outfalls from the airport, oil and water separators at three fuel sites, discharges from snow-melters, and the downstream receiving water.

As part of their Storm Water Pollution Prevention Plan to minimize the discharge of pollutants and impacts to the receiving water, the permit includes goals to capture glycol to the maximum extent practicable and to reduce the amount of glycol used through conservation efforts. Management practices consist of collecting glycol in the terminal area with glycol recovery vehicles that vacuum up residual glycol, centralized deicing pads with collection facilities, and use of the storm sewers as a temporary inline storage system that is pumped out after a deicing event. The recovered glycol is typically trucked to the anaerobic digesters at the Milwaukee Metropolitan Sewerage District (MMSD). Recycling generally isn't feasible but may be a future option depending on market conditions. Conservation efforts, which reduce the amount of glycol that otherwise would be used, consist of mechanically brooming aircraft to remove snow, blending an event-specific dilution of glycol based on the ambient temperature, close spraying to prevent overspray, and hybrid technology that utilizes forced air.

The wastewater activities onsite that require a WPDES wastewater permit are deicing activities, snow-melting and discharge from the oil/water separators. Therefore, the only WPDES wastewater regulated discharges outside of the deicing season are from the oil/water separators.

Attachment #2 is a map of the area showing the approximate location of the outfalls.

Existing Permit Limitations: The current permit, which expired on September 30, 2019, does not include any numeric effluent limitations. The permit only requires quarterly monitoring for the following parameters Outfalls 001, 003, and 007:

- Flow Rate
- BOD_5
- COD, filtered
- Total Nitrogen
- Oil & Grease
- pH
- Propylene glycol
- Total suspended solids
- Total Phosphorus

Receiving Water Information:
Outfall 007 and Outfall 001

- Name: Wilson Park Creek
- Classification: (Default) Warm water sport fish community, non-public water supply. (Cold Water and Public Water Supply criteria would be used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin.)
- Low Flow: Continuous flow monitoring is available at USGS for Station 040871473 where Wilson Park Creek enters the airport property near Bailey's Pond. The following low flow statistics are calculated using flow data from 1996 to 2017.
  $7\text{-}Q_{10}$ = 0 cfs (cubic feet per second)
  $7\text{-}Q_2$ = 0.004 cfs
  $1\text{-}Q_{10}$ = 0 cfs
  $30\text{-}Q_5$ = 0.017 cfs

- Hardness = 425 mg/L as $CaCO_3$. This value represents the geometric mean of data from SWIMs station 413811 on Wilson Park Creek River from 1998 to 2000.
- Source of background concentration data: Background concentrations are not included because they don't impact the calculated WQBEL when the receiving water low flows are equal to zero. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: Not applicable
- Impaired water status: Wilson Park Creek is 303(d) listed as impaired for fecal coliform.

Outfall 003

- Name: Tributary to Oak Creek
- Classification: (Default) Warm water sport fish community, non-public water supply. (Cold Water and Public Water Supply criteria would be used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin.)
- Low Flow: The tributary to Oak Creek begins just upstream of GMIA. No flow data is available for the tributary, but low flows in the tributary are expected to be zero.
  $7\text{-}Q_{10}$ = 0 cfs (cubic feet per second)
  $7\text{-}Q_2$ = 0 cfs

- Hardness = 446 mg/L as $CaCO_3$. This value represents the geometric mean of monitoring data from SWIMs station 413835 on the tributary from 1998 to 2000.
- Source of background concentration data: Background concentrations are not included because they don't impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: Not applicable
- Impaired water status: Oak Creek is 303(d) listed as impaired for phosphorus, chloride, and unknown pollutants.

Effluent Information:

- Flow Rate: Flow data from Outfalls 001 and 007 and Inflow 701 comes from USGS gauge stations maintained at these locations. Because flows measured at 007 includes the receiving water, the inflow at 701 is subtracted out for use in limit calculations to obtain only the "effluent" flow rate. No gauge data is available for Outfall 003, so DMR flow data is used. The flow data from October 2014 to April 2020 from both sources is summarized below. The average flow rate for each outfall is used

for limit calculations in this limits evaluation.

	Outfall 001	Outfall 003	Outfall 007	Inflow 701	007 Effluent alone
USGS Station (if applicable)	040871476	-	040871475	040871473	(007 minus 701)
Maximum annual average*	0.27 MGD	-	5.1 MGD	1.5 MGD	3.7 MGD
Maximum monthly average	0.81 MGD	-	10 MGD	3.1 MGD	7.1 MGD
Maximum weekly average	1.8 MGD	-	27 MGD	8.8 MGD	19 MGD
Daily Max	6.6 MGD	-	106 MGD	29 MGD	77 MGD
Average	0.18 MGD	3.8 MGD	3.5 MGD	1.1 MGD	2.4 MGD
*The approved TMDL waste load allocations established for GMIA were based on the maximum annual average flow in the 2014 permit application: 0.06 MGD for Outfall 001 and 3.14 MGD for Outfall 007.					

- Hardness = The following hardness values are from the permit application monitoring where one result was available for each outfall location:
    - Outfall 001: 66.8 mg/L as $CaCO_3$
    - Outfall 003: 396 mg/L as $CaCO_3$
    - Outfall 007: 252 mg/L as $CaCO_3$
- Acute dilution factor used: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Additives: The deicers and anti-icers used at GMIA are considered additives present in the discharge, as defined in the "Water Quality Review Procedures for Additives (2019)" guidance. Toxicity of these is evaluated in Part 7. Potassium acetate and sodium formate are also used for pavement deicing.
- Effluent characterization: The permit application required effluent sample analyses for a limited number of common pollutants, primarily metal substances plus Ammonia, Chloride, Hardness and Phosphorus. The results are shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

The following table presents the average concentrations at each of the outfalls from October 2014 to April 2020:

	Outfall 001	Outfall 003	Outfall 007
BOD_5	1540 mg/L	96.9 mg/L	474 mg/L
Total Kjeldahl Nitrogen	1.36 mg/L	1.13 mg/L	1.23 mg/L
Oil & Grease	2.43 mg/L	1.97 mg/L	1.33 mg/L
pH field	7.26 su	7.81 su	7.60 su
Total Phosphorus	0.536 mg/L	0.085 mg/L	0.320 mg/L
Total Suspended Solids	37.2 mg/L	7.30 mg/L	28.9 mg/L
Propylene glycol	1942 mg/L	49.6 mg/L	417 mg/L
COD, filtered	3217 mg/L	174 mg/L	953 mg/L

*Results below the level of detection (LOD) were included as zeroes in calculation of the average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

In general, permit limits for toxic substances are recommended whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the P_{99} value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q_{10}

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q_{10} receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards.

$$\text{Limitation} = \frac{(WQC)\,(Qs + (1-f)\,Qe) - (Qs - f\,Qe)\,(Cs)}{Qe}$$

Where:

WQC =Acute toxicity criterion or secondary acute value according to ch. NR 105

Qs = average minimum 1-day flow which occurs once in 10 years (1-day Q_{10})
if the 1-day Q_{10} flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q_{10}).

Qe = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d)

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

Cs = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e).

In this case, limits are calculated using the mass balance formula since these values are more restrictive. Since receiving water low flows are zero, daily maximum limits would be set equal to acute criteria.

The following tables list the water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in term of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0 cfs, (1-Q_{10}).

Outfall 001					
SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chlorine		19.0	19.0	3.81	<30
Arsenic		340	340	68.0	<5.0
Cadmium	67	6.49	6.49	1.30	<1.0
Chromium	67	1300	1300	259	2.59
Copper	67	10.6	10.6	2.12	**11.4**
Lead	67	72.4	72.4	14.5	<3.0
Nickel	67	334	334	66.7	2.63
Zinc	67	84.6	85	16.9	**139**
Chloride - mg/L		757	757	151	9.6

Outfall 003					
SUBSTANCE	REF. HARD.* mg/L	ATC	MAX. EFFL. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chlorine		19.0	19.0	3.81	**234**
Arsenic		340	340	68.0	<5.0
Cadmium	396	50.0	50.0	10.0	<1.0
Chromium	301	4446	4446	889	1.05
Copper	396	56.9	56.9	11.4	<5.0
Lead	356	365	365	72.9	<3.0
Nickel	268	1080	1080	216	3.01
Zinc	333	345	345	68.9	24.4
Chloride - mg/L		757	757	151	**1720**

Outfall 007					
SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chlorine		19.0	19.0	3.81	**123**
Arsenic		340	340	68.0	<5.0
Cadmium	252	29.8	29.8	6.0	<1.0
Chromium	252	3844	3844	769	1.24
Copper	252	37.1	37.1	7.4	**10.7**
Lead	252	261	261	52.2	<3.0
Nickel	252	1025	1025	205	3.17
Zinc	252	270	270	54.0	**76.3**
Chloride - mg/L		757	757	151	**1270**

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105 over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

For the remaining categories of toxicity criteria, limits are the same for each Outfall because they are all based on a receiving water flow of zero and the receiving water hardness is greater than the maximum in the range of hardness for each pollutant.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0 cfs (¼ of the 7-Q_{10})

					Mean Effluent Concentrations		
SUBSTANCE	REF. HARD.* mg/L	CTC	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	Outfall 001	Outfall 003	Outfall 007
Chlorine		7.28	7.28	1.46	<30	**234**	**123**
Arsenic		152	152	30.4	<5.0	<5.0	<5.0
Cadmium	175	3.82	3.82	0.76	<1.0	<1.0	<1.0
Chromium	301	326	326	65.2	2.59	1.05	1.24
Copper	425	35.7	35.7	7.14	**11.4**	<5.0	**10.7**
Lead	356	95.5	95.5	19.1	<3.0	<3.0	<3.0
Nickel	268	120	120	24.0	2.63	3.01	3.17
Zinc	333	345	345	68.9	**139**	24.4	**76.3**
Chloride - mg/L		395	395	79.0	9.60	**1720**	**1270**

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0 cfs (¼ of the Harmonic Mean)

				Mean Effluent Concentrations		
SUBSTANCE	HTC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	Outfall 001	Outfall 003	Outfall 007
Cadmium	370	370	74.0	<1.0	<1.0	<1.0
Chromium (+3)	3818000	3818000	763600	2.59	1.05	1.24
Lead	140	140	28.0	<3.0	<3.0	<3.0
Nickel	43000	43000	8600	2.63	3.01	3.17

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0 cfs (¼ of the Harmonic Mean)

				Mean Effluent Concentrations		
SUBSTANCE	HCC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	Outfall 001	Outfall 003	Outfall 007
Arsenic	13.3	13.3	2.66	<5.0	<5.0	<5.0

Because effluent data is available for only one substance for which Human Cancer Criteria exists, and it was not detected in the effluent, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, reasonable potential is shown for **chlorine, copper, zinc, and chloride** at one or more of the outfalls. This is based on a single sample result from the permit application. For reference, the precipitation and temperature conditions occurring on the day of each sample result are summarized below:

	001	**003**	**007**
Chlorine	02/04/2019 0.07 in rain, temp. above freezing	12/18/2018 no pcip., temp. above freezing	12/18/2018 no pcip., temp. above freezing
Copper	12/01/2018 1 in rain, temp. above freezing	11/26/2018 0.1 in snow, temp. above freezing	11/25/2018 1.1 in snow, temp. above freezing
Zinc	12/01/2018 1 in rain, temp. above freezing	11/26/2018 0.1 in snow, temp. above freezing	11/25/2018 1.1 in snow, temp. above freezing
Chloride	12/01/2018 1 in rain, temp. above freezing	11/26/2018 0.1 in snow, temp. above freezing	11/25/2018 1.1 in snow, temp. above freezing

Since the facility does not add chlorine to any waste stream or runoff, it's unclear what the reason for the high chlorine measurement at Outfall 003. Chlorine may be coming from the chlorinated city water used to dilute glycol prior to application or the high result may be caused by some method interference. Additional sampling is recommended to determine if the previous result was representative. Salt used for roads and sidewalks "outside the fence" may be contributing to the discharge and it's known that streams in this area have high chloride levels, so the high chloride measurements at Outfalls 003 and 007 may come from the receiving streams. The source of these other pollutants may also be the receiving stream, but no data is available to confirm this.

Its recommended that the reissued permit include monitoring for these parameters at both the influent and effluent points in order to determine if GMIA is causing or contributing to an exceedance of water quality criteria. Since only a single sample result is available at each outfall, monitoring for all four parameters is recommended at each outfall. Hardness monitoring is also recommended due to the relationship between effluent hardness and toxicity.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BOD

In establishing BOD_5 (Biochemical Oxygen Demand) limitations, the primary intent is to prevent a lowering of dissolved oxygen levels in the receiving water below water quality standards as specified in ss. NR 102.04(4)(a) and (b), Wis. Adm. Code.

A 2000 study from USGS, *Aircraft and Runway Deicers at General Mitchell International Airport, Milwaukee, Wisconsin, USA. 1. Biochemical Oxygen Demand and Dissolved Oxygen in Receiving Streams,* evaluated BOD and dissolved oxygen from GMIA and in the receiving stream during deicing events in 1996 to 1998. The study showed that during deicing events:

- General Mitchell was discharging very high levels of BOD (~300 mg/L to >10,000 mg/L)
- Instream BOD levels remained elevated up to 5 miles downstream (~100 mg/L to 700 mg/L). Reductions in BOD levels downstream may be accounted for by the increased dilution available downstream (i.e. BOD may not degrade significantly over this distance).
- Despite high BOD levels, dissolved oxygen levels did not decrease significantly. Decreases in stream DO did not appear to be related to deicing events.

The DO standard for Fish and Aquatic Life waters is 5.0 mg/L. The study findings showed that during deicing periods, downstream dissolved oxygen levels averaged around 8.0 mg/L and fell below the 5.0 mg/L standard for an hour about once every 15 days.

Based on the study, the lack of an observed DO sag during deicing events might be due to several factors. The low winter temperatures may slow metabolism and BOD degradation. Due to the fast stream travel time (reaches estuary in about 24 hours) little of the BOD load may be exerted before deicing water reaches Lake Michigan. The study also cited high reaeration rates for Wilson Park Creek that may mitigate the high BOD loading. Wilson Park Creek travels underground or in concrete channels for much of its path to the Kinnickinnic River. Microbiota may be hindered by the lack of natural stream habitat or by the presence of toxic substances commonly found in urban streams, such as chlorides.

Typically, BOD_5 limits to ensure stream DO levels remain above 5.0 mg/L are calculated using the 26-pound method, which assumes a 1 mg/L drop in dissolved oxygen for every 13 lbs of BOD discharged per cubic foot of stream flow during critical conditions. However, the study shows that this discharge and Wilson Park Creek does not follow this relationship in the winter.

MMSD is in the process of planning a flood management project for Wilson Park Creek Reach 3 (just downstream of Outfall 007) which will naturalize about 1 mile of the stream over the next few years. When this project is completed, BOD and DO dynamics may be significantly different. There is no DO data from deicing events available since the 1996-1998 study.

Considering these factors, effluent and instream DO monitoring at Outfall 007 and a point downstream from Outfall 007 is recommended during deicing and anti-icing events and melting or other runoff events in the next permit term. This may occur at the current instream sample point 601 or another approved location. This monitoring will help to determine whether or not DO water quality standards are met during deicing and provide information to determine BOD discharge levels to ensure DO standards are met.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for this substance effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that General Mitchell does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):

Daily maximum limitations are based on acute toxicity criteria, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$ATC \text{ in mg/L} = [A \div (1 + 10^{(7.204 - pH)})] + [B \div (1 + 10^{(pH - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and

pH (s.u.) = that characteristic of the effluent.

The effluent pH data for the past five years was examined as part of this evaluation. A total of 20 sample results were reported at each outfall from November 2014 to February 2020 as summarized in the table below. Due to the small data set available, the maximum from each data set is considered to be the reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen.

Substituting the maximum pH value into the equation above yields an **ATC of 8.4 mg/L, 6.6 mg/L, and 7.6 mg/L for Outfalls 001, 003, and 007 respectively**. Since the estimated 1-Q_{10} receiving water flow at each outfall is 0 cfs, the daily max limit would be equal to the ATC values.

Effluent pH			
	Outfall 001	Outfall 003	Outfall 007
1-day P_{99}	7.99	8.16	8.26
4-day P_{99}	7.62	7.98	7.92
30-day P_{99}	7.39	7.87	7.72
Mean*	7.26	7.81	7.60
Std	0.30	0.15	0.27
Sample size	22	22	22
Range	6.71 - 8.00	7.60 - 8.13	6.94 - 8.05
Respective Daily Max Limit	8.4 mg/L	6.6 mg/L	7.6 mg/L

Weekly Average & Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, since those limits relate to the assimilative capacity of the receiving water. Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria.

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warm Water Sport Fish Community is calculated by the following equation.

$$CTC = E \times \{[0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})]\} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,

C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or

C = $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and

T = the temperature (ºC) of the receiving water – (Early Life Stages Present), or

T = the maximum of the actual temperature (ºC) and 7 - (Early Life Stages Absent)

The 4-day criterion is simply equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q_3, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 ºC, 25% of the flow is used if the Temperature < 11 ºC, and 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

The rules provide a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 ºC, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in Wilson Park Creek or the tributary to Oak Creek. So "ELS Absent" criteria apply from October through March, and "ELS Present" criteria will apply from April through September for a warmwater sport fish classification

Since minimal ambient data is available, the "default" basin assumed values are used for temperature and background ammonia concentrations, shown in the table below. Instead of default pH values, the seasonal averages of pH monitoring results at Sampling Point 701 (Inflow at Bailey's Pond) are used.

Outfall 003		**Spring**	**Summer**	**Winter**
		April & May	**June – Sept.**	**Oct. - March**
Effluent Flow	Qe (MGD)	3.8	3.8	3.8
Background Information	7-Q_{10} (cfs)	0	0	0
	30-Q_5 (cfs)	0	0	0
	Ammonia (mg/L)	-	-	-
	Average Temperature (°C)	12	19	4
	Max Temperature (°C)	14	21	10
	pH (s.u.)	7.81	7.66	7.82
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	**7.90**	**6.32**	7.75
	Early Life Stages Absent	7.93	6.32	**10.4**
	30-day Chronic			
	Early Life Stages Present	**3.16**	**2.53**	3.10
	Early Life Stages Absent	3.17	2.53	**4.15**
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	**7.90**	**6.32**	7.75
	Early Life Stages Absent	7.93	6.32	**10.4**
	Monthly Average			
	Early Life Stages Present	**3.16**	**2.53**	3.10
	Early Life Stages Absent	3.17	2.53	**4.15**

Attachment #1

Outfalls 001 and 007		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD) (001 flow+007 flow)	3.68	3.68	3.68
Background Information	7-Q_{10} (cfs)	0	0	0
	30-Q_5 (cfs)	0.017	0.017	0.017
	Ammonia (mg/L)	0.04	0.03	0.08
	Average Temperature (°C)	12	19	4
	Max Temperature (°C)	14	21	10
	pH (s.u.)	7.81	7.66	7.82
	% of Flow used	50	100	25
	Reference Weekly Flow (cfs)	0	0	0
	Reference Monthly Flow (cfs)	0.0085	0.017	0.0043
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	**7.90**	**6.32**	7.75
	Early Life Stages Absent	7.93	6.32	**10.4**
	30-day Chronic			
	Early Life Stages Present	**3.16**	**2.53**	3.10
	Early Life Stages Absent	3.17	2.53	**4.15**
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	**7.90**	**6.32**	7.75
	Early Life Stages Absent	7.93	6.32	**10.4**
	Monthly Average			
	Early Life Stages Present	**3.16**	**2.53**	3.10
	Early Life Stages Absent	3.18	2.53	**4.15**

Effluent Data
A single effluent ammonia monitoring result for each outfall from 2018 submitted with the permit application are presented below.

Ammonia-Nitrogen (mg/L)		
Outfall 001	Outfall 003	Outfall 007
0.224	0.212	0.0406

To determine the need for ammonia limits, these effluent samples are compared to one fifth of the calculated limits. To determine reasonable potential for ammonia limits when less than 11 sample results are available, one fifth of the calculated limits is compared to the average. The most stringent calculated limit is 2.53 mg/L, and one fifth of this is 0.51 mg/L. The effluent measurements do not exceed one fifth of any of the calculated ammonia limits. **Based on this comparison, no ammonia-nitrogen limits are recommended in the reissued permit.**

PART 5 –LIMITATIONS FOR PHOSPHORUS AND TOTAL SUSPENDED SOLIDS (TSS)

Technology Based Phosphorus Limit
Subchapter II of Chapter NR 217, Wis. Adm. Code, requires industrial facilities that discharge greater than 60 pounds of Total Phosphorus per month to comply with a 12-month rolling average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because GMIA does not currently have an existing technology-based limit, the need for this limit in the

reissued permit is evaluated. The data demonstrates that the sum of monthly average phosphorus loading from all outfalls combined is greater than 60 lbs/month, which is the threshold for industrial facilities in accordance to s. NR 217.04(1)(a)2, Wis. Adm. Code, and therefore a technology-based limit is required at each outfall.

Outfall 001

Month	Average Phosphorus Concentration (mg/L)	Average Effluent Flow (MGD)	Calculated Mass (lbs/month)
2015	0.130	0.264	8.6
2016	0.540	0.226	30.6
2017	0.393	0.037	3.6
2018	0.476	0.503	59.9
2019	1.274	0.364	116.1
2020	0.075	0.443	8.3
Average			37.8

Outfall 003

Month	Average Phosphorus Concentration (mg/L)	Average Effluent Flow (MGD)	Calculated Mass (lbs/month)
2016	0.0547	2.19	29.9
2017	0.1135	1.08	30.5
2018	0.0953	2.54	60.5
2019	0.0727	4.04	73.4
2020	0.0533	2.10	28.0
Average			44.5

*2015 data is excluded due to unusually high flows during this year.

Outfall 007

Month	Average Phosphorus Concentration (mg/L)	Average Effluent Flow (MGD)	Calculated Mass (lbs/month)
2015	0.517	2.07	267
2016	0.206	1.70	87.7
2017	0.326	2.00	163
2018	0.345	2.78	240
2019	0.247	3.68	227
2020	0.432	2.55	276
Average			210

Total P (lbs/month) =

Monthly average (mg/L) × annual average design flow (MGD) × 8.34 (lbs/gallon) × 30 (day/month)

In addition, the need for a WQBEL for phosphorus must be considered.

Milwaukee River TMDL: Outfalls 001 and 007

The Milwaukee River Total Maximum Daily Load (TMDL) report was approved by EPA in March 2018. The TMDL report addresses phosphorus, TSS, and bacteria water quality impairments within the Milwaukee River Basin and provides wasteload allocations (WLAs) required to meet water quality

standards. The discharges from Outfalls 001 and 007 are located in the Milwaukee River Basin and are assigned mass WLA for phosphorus and TSS in the TMDL report. (Fecal coliform discharge allocations do not apply to GMIA.) The TMDL report, along with the referenced appendices can be found at: http://dnr.wi.gov/topic/TMDLs/Milwaukee/

The TSS target concentration for the Milwaukee River Basin established by the WDNR TMDL technical team for the analysis is 12 mg/L expressed as a median of monthly samples collected between May and October. A summary of the basis for this target is provided in 3.2.2 of the TMDL report. The WLAs included in the TMDL report are a product of the calculated baseline loading (permit limit or average concentration × maximum 12-month flow) and the specified reduction necessary to meet the water quality target in the receiving and downstream waters.

The annual phosphorus and TSS WLAs for each outfall are listed in the table below. The TMDL report also splits these allocations into monthly mass allocations for each outfall.

The TMDL includes percent reduction goals for MS4 located within the TMDL area which are listed below for informational purposes. The total percent reduction goal includes both the percent reduction from respective reaches of the TMDL and the percent reductions for stormwater of 20% for TSS and 11% for phosphorus from ch. NR 151, Wis. Adm. Code. The total percent reduction represents the total amount that GMIA would need to demonstrate has been achieved from a "no controls" condition in order for the goals of the TMDL to be met.

		Outfall 001	**Outfall 007**
Reach Number		**KK-5**	**KK-4**
Phosphorus	Annual WLA (lbs/year)	28.35	730.27
	TMDL Reach Percent Reduction	76%	88%
	Total Percent Reduction*	79%	89%
TSS	Annual WLA (lbs/year)	2814.54	63441.40
	TMDL Reach Percent Reduction	75%	80%
	Total Percent Reduction*	80%	84%
* percent reductions presented as from "no controls" condition			

Permit conditions for TSS and phosphorus should be expressed in a manner consistent with the WLAs and assumptions of the TMDL, as well as available guidance. Although the TMDL report includes monthly phosphorus and TSS WLAs for GMIA, including these limits in the permit is not appropriate for GMIA due to the noncontinuous and storm event-related nature of the discharges. Instead, **the annual WLAs are recommended as limits in the reissued permit**.

Sampling of the pavement deicers, aircraft deicer and anti-icer products determined that several products contain high levels of phosphorus from the corrosion inhibitors in the product formulations. The discharges from Outfall 001 and 007 contain discrete controllable sources of phosphorus. Therefore, a percent reduction approach to TMDL implementation based on modeling reductions based on best management practices is not appropriate for these discharges.

Effluent Data

For informational purposes the estimated annual discharge loads of TSS and phosphorus from 2015 to 2019 are shown below. The majority of these annual loads exceed the annual WLA shown in the table

above. However, each annual load is calculated based on just four flow and concentrations measurements because the current permit includes quarterly monitoring. A compliance schedule and additional monitoring is recommended in the reissued permit to better assess the pollutant reduction progress of the GMIA discharges.

	Phosphorus (lbs/year)		TSS (lbs/year)	
	001	007	001	007
Annual WLA	28.35	730.3	2,815	63,441
2015	104	16,658	38,535	1,792,418
2016	372	1,271	28,737	81,369
2017	44.3	988	2,472	77,122
2018	728	2,733	45,870	196,755
2019	1,412	4,755	65,642	501,975
Average Annual Mass	382	2,829	26,318	470,430

Outfall 003

Total Suspended Solids – Outfall 003

There are no numeric water quality criteria for TSS applicable to Oak Creek. Therefore, no TSS limits are recommended at Outfall 003.

NR 217.13 Phosphorus WQBELs

Outfall 003 is not located within the TMDL area, and therefore phosphorus WQBELs should instead be based on the procedures in s. NR 217.13, Wis. Adm. Code. Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(3)(a), Wis. Adm. Code, specifically names river segments for which a phosphorus criterion of 0.1 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.075 mg/L applies for the tributary to Oak Creek.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs), effluent flow rate (Qe), and upstream phosphorus concentrations (Cs):

$$\text{Limitation} = [(WQC)(Qs+(1-f)\ Qe) - (Qs-f\ Qe)\ (Cs)]/Qe$$

Where:

WQC = 0.075 mg/L for the tributary to Oak Creek.
Qs = 100% of the 7-Q_2 of 0 cfs
Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code
Qe = effluent flow rate = 3.68 MGD
f = the fraction of effluent withdrawn from the receiving water = 0

Since the receiving water low flow is equal to zero, the effluent limit is set equal to criteria. According to s. NR 217.14 (2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of **0.075 mg/L may be expressed as a six-month average**. If a concentration limitation expressed as a six-month average is included in the permit, **a monthly average concentration limitation of 0.225 mg/L**, equal to three times the WQBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Because the discharge is to a surface water that is upstream of Lake Michigan, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. **This final mass limit shall be 0.075 mg/L × 8.34 × 3.68 MGD = 2.3 lbs/day expressed as a six-month average.** Based on the monitoring data summarized below, a phosphorus compliance schedule will be needed at Outfall 003.

Effluent data summary
The following table summarizes phosphorus and TSS discharge data, reported in SWAMP from November 2014 to February 2020.

	TSS (mg/L)			**Phosphorus (mg/L)**		
	Outfall 001	Outfall 003	Outfall 007	Outfall 001	Outfall 003	Outfall 007
1-day P_{99}	181	23.8	126	2.84	0.273	1.50
4-day P_{99}	99.4	14.3	70.4	1.54	0.165	0.824
30-day P_{99}	55.7	9.48	41.4	0.813	0.110	0.470
Mean	37.2	7.30	28.9	0.512	0.0850	0.320
Std	37.0	4.61	25.4	0.594	0.0529	0.303
Sample Size	22	22	22	22	21	21
Range	1 - 130	2.4 - 22.5	4 - 122	<0.008 – 1.91	0.0379 – 0.281	0.0548 – 1.09

Phosphorus Interim Limit for Outfalls 001, 003, and 007
An interim limit is required per s. NR 217.17 when a compliance schedule is needed in the permit to meet the WQBEL. The interim limit should reflect a concentration that the facility is able to meet without investing in additional "temporary" treatment, but also should prevent backsliding from current conditions.

Based on the available phosphorus monitoring data, the TMDL limits and the 1.0 mg/L monthly average limits are not readily attainable for Outfalls 001 and 007. The discharge from Outfall 003 appears to meet the 1.0 mg/L monthly average limit but does not meet the phosphorus WQBELs of 0.075 mg/L and 0.225 mg/L.

Therefore, the technology-based limit of 1.0 mg/L is recommended as the interim limit at Outfall 003.

At Outfalls 001 and 007 it is more difficult to determine a current maximum expected discharge concertation to set as an interim limit. There is a limited data set for phosphorus from this facility from the quarterly monitoring and the data is highly variable. **Therefore, a narrative interim phosphorus limit is deemed more appropriate for Outfalls 001 and 007**. A narrative Interim Phosphorus Limitation similar to the following is recommended for each outfall: "The facility shall be operated such that the amount of phosphorus being discharged on an average annual basis does not increase over the permit

term, and that the phosphorus reductions will occur over time through best management practices and operational changes."

PART 6 –THERMAL

New surface water quality standards for temperature took effect on October 1, 2010. These new regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

No effluent temperature data is available for Outfalls 001, 003, or 007. The discharges from General Mitchell are made up of stormwater and not expected to have significant heat loads. In accordance with the applicability criteria in s. NR 106.51, Wis. Adm. Code, no temperature limits are recommended for General Mitchell since discharge temperatures are expected to be similar to ambient stream temperatures.

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. The following evaluation is based on procedures in the Department's WET Program Guidance Document (revision #12, dated October 2019).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC). The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). Because the 7-Q_{10} estimates in both receiving waters are zero, the IWC is 100% for Outfalls 001, 003, and 007.

The most probable sources of toxicity covered by this permit are the deicing and anti-icing products used at the airport. Secondary acute and chronic values for these products were derived according to s. NR 105.05, Wis. Adm. Code, and the *Water Quality Review Procedures for Additives* guidance (http://dnr.wi.gov/topic/wastewater/Guidance.html) based on toxicity data available in each product's SDS. This value represents the additive concentration not to be exceeded in the receiving water in order to protect fish and aquatic life designated uses from acute and chronic impacts.

The main Type I deicer used by GMIA is Polar Plus LT and a 50% pre-diluted version of the product called Polar Plus 50/50 Dilute. Even though the ingredient concentrations in the 50/50 diluted product are much lower, the toxicity testing results for this product show more toxicity than the undiluted product. To be conservative, the toxicity data from the diluted product is utilized here.

Attachment #1

Additive Name	Manufacturer	Purpose of Additive	Secondary Acute Value mg/L[1]	Secondary Chronic Value mg/L[1]
Polar Plus 50/50 Dilute	Cryotech	Type I Deicing (primary type 1 used)	488 mg/L	27.1 mg/L
Kilfrost DF Sustain	Kilfrost Ltd.	Type I Deicing (secondary type 1)	2019 mg/L	112 mg/L
Polar Guard Advance	Cryotech	Type IV aircraft deicing	54.4 mg/L	3.02 mg/L

Estimating additive discharge concentrations based on discharged propylene glycol concentrations, it appears that the deicer products used at GMIA may be present at levels which would cause unacceptable levels of toxicity in the receiving water. However, propylene glycol cannot necessarily be used as a surrogate for toxicity or whole product concentration, since the fate and transport of other deicer components may be different than propylene glycol. Because of this, it's difficult to estimate concentrations of each deicing product that would reach the receiving water.

Acute and chronic WET testing is recommended in the reissued permit at each outfall in order to test the assumption that current BMPs ensure that water quality standards are met in each receiving water. Chronic WET testing measures longer term effects and chronic WET tests are typically applied in situations where the discharge takes place for 4 or more days in any 7 day period. This kind of discharge containing anti-icer and de-icer products is mostly expected to occur during spring melt events, and therefore chronic effects will only be examined during these events.

The acute WET testing data collected should meet the following criteria:

- Tests should be conducted to measure effluent toxicity at Outfalls 001, 003, and 007.
- Tested sample should be composed of only deicing-affected runoff from the GMIA site in order to measure toxicity associated with deicing activities (not a combination of receiving water and deicing water, like samples from Outfall 007).
- Tests must be performed on *Ceriodaphnia dubia* and fathead minnow using approved test methods in s. NR 219.04, Wis. Adm. Code.
- Acute tests should be scheduled to representatively capture toxicity from typical storm events and snow melting events.
- The total set of acute tests each year should cover each type of deicer and anti-icer product used and different types of weather events that may occur (freezing rain, falling snow, and melting snow).

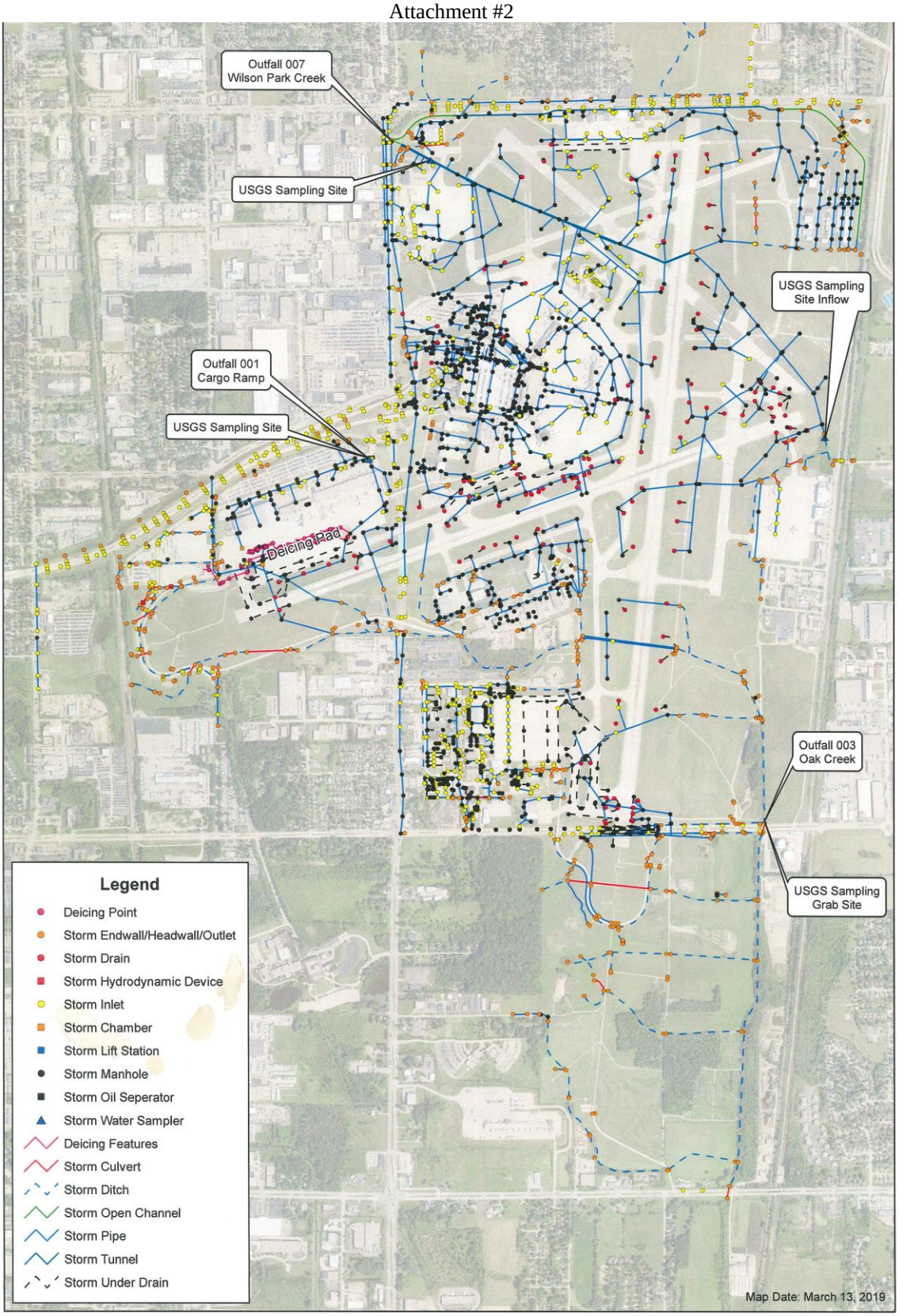
Chronic testing should representatively capture spring melt events from at least 2 years when the weather forecast calls for the first extended period of warm weather and/or rainfall.

The department recognizes that there may be several obstacles to obtaining representative samples for WET testing, due to the storm event-related nature of the discharge and the presence of receiving water flow in the storm sewers. Highly variable discharge conditions may make it difficult to collect a sample when most toxic effects would occur, and this may require multiple samples. WET testing during storm events presents logistical challenges including scheduling tests based on weather, staff availability,

delivering the sample within the 36 hour hold time, and safe access to the sample site. The testing plan might include one or more of the following strategies:

- Collection of single grab samples or multiple grab samples in place of the 24-hour composite sample typically used for WET testing.
- Conducting WET tests using one, larger volume effluent sample instead of two samples collected over a 4 day period (for acute) or three samples collected over a 7 day period (for chronic) that are typically required to complete a WET test.
- Performing WET tests on samples from the storm sewer system manholes or a composite of multiple locations prior to combination with the receiving water.
- WET testing focused on the discharges at Outfalls 001 or 003, if these are less impacted by any upstream flow in their respective receiving waters.
- Driving samples to the WET lab instead of relying on commercial carriers, if necessary to meet the 36-hour hold time requirement.

The department recognizes that GMIA will need time to consider the best methods to carry out WET testing. Its recommended that the permit include a schedule to create and submit a WET testing plan to the department. The schedule should allow time for the department to give feedback if needed prior to approval and implementation in the next deicing season.


Outfall 007
Wilson Park Creek
USGS Sampling Site
USGS Sampling
Site Inflow
Outfall 001
Cargo Ramp
USGS Sampling Site
Deicing Pad
Outfall 003
Oak Creek
USGS Sampling
Grab Site
Legend
Deicing Point
Storm Endwall/Headwall/Outlet
Storm Drain
Storm Hydrodynamic Device
Storm Inlet
Storm Chamber
Storm Lift Station
Storm Manhole
Storm Oil Seperator
Storm Water Sampler
Deicing Features
Storm Culvert
Storm Ditch
Storm Open Channel
Storm Pipe
Storm Tunnel
Storm Under Drain
Map Date: March 13, 2019